Title: Microfabrication processes for microfluidic devices on a single laser workstation: direct writing lithography on SU-8, laser ablation on polymers and mask manufacturing

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Abstract:

We demonstrate the capability of a laser micromachining workstation for cost-effective manufacturing of a variety of microfluidic devices, including SU-8 microchannels on silicon wafers and 3D complex structures made on polyimide Kapton® or polycarbonate (PC). The workstation combines a KrF excimer laser at 248 nm and a Nd^{3+}:YVO_4 DPSS with a frequency tripled at 355 nm with a lens magnification 10X, both lasers working at a pulsed regime with nanoseconds (ns) pulse duration. Workstation also includes a high-resolution motorized XYZ-tilt axis (~ 1 um / axis) and a Through The Lens (TTL) imaging system for a high accurate positioning over a 120 x 120 mm working area.

We have surveyed different fabrication techniques: direct writing lithography, mask manufacturing for contact lithography and polymer laser ablation for complex 3D devices, achieving width channels down to 13 μm on 50 μm SU-8 thickness using direct writing lithography, and width channels of 40 μm for polyimide on SiO_2 plate.

Finally, we have tested the use of some devices for capillary chips measuring the flow speed for liquids with different viscosities. As a result,we have characterized the presence of liquid in the channel by interferometric microscopy.

(a) (b)

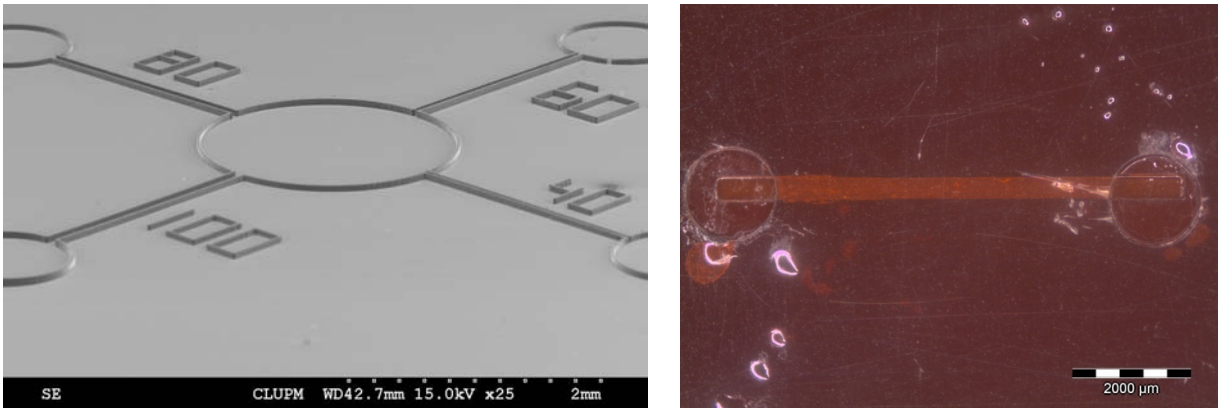

Figure 1. (a) SEM image of a 4 channel microfluidic device with a central deposit. (b) 3D complex device on polyimide 50 um thickness.

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